EFI®
Engineering and Fire
Investigations

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ENGINEERING REPORT
One and Final

Insured:	**Nancy McNeil**
Loss Location:	**Medford, MA**
Date of Loss:	**October 11, 2001**
Policy No.:	**HO12016316**
Claim No.:	**Unknown**
EFI File No.:	**94507 - 17807**

Report Date: August 16, 2002

Prepared For: Vermont Mutual Insurance Co.
P.O. Box 188
Montpelier, VT 05601

Attention: Mr. Richard Delaney

9/10

PROCTOR-SILEX TOASTER AND KELLOGG'S FROSTED STRAWBERRY POP-TART

SUMMARY

The cause of this fire was previously determined to be a Proctor-Silex toaster containing a single Kellogg's Frosted Strawberry Pop-Tart. Pop-Tarts will catch fire if heated to a high enough temperature. A warning label on the Pop-Tart package states this fact and there are numerous documented cases of this happening. Examination of the Proctor-Silex toaster showed that it had a defect that prevented it from shutting off and ejecting the Pop-Tart at the end of the normal toasting cycle. The toaster remained on and continued to heat and eventually ignited the Pop-Tart.

BACKGROUND

I received this assignment on 5/28/02 from EFI's Fire Investigator, Jeff Lowe. Jeff wrote an original and a supplemental report on this loss and these reports contain complete and detailed information regarding the Pop-Tart's flammability characteristics. Jeff notified all parties involved in this loss (letter dated 7/23/02, attached) that an examination of the toaster would be conducted on 8/13/02 per a protocol that I wrote (attached). The examination was conducted, as scheduled, on 8/13/02 with all parties present except Proctor-Silex. Proctor-Silex did not notify EFI that it could not attend. The people who attended were: Mike Rains, EFI (for Vermont Mutual); Wayne Miller, Wright Group (for Kellogg's); Jeff Tanski, FTI/SEA (for NLC Insurance); Jim Macdonald and Rebecca Emmonds, Constitution State Services (for Kellogg's).

EVIDENCE DESCRIPTION AND CONDITION

The toaster is a Proctor-Silex model 22430 rated 120 volts, 900 watts. It is UL listed and CSA certified. According to the building tenant and toaster user, the toaster contained a single Kellogg's Strawberry Frosted Pop-Tart. As stated in Jeff's reports, the toaster was damaged externally with most of its external plastic housing burned away. It also had internal damage, primarily to the side containing the line cord entrance and heater switch assembly. The other side containing the solenoid release and ejection spring assembly was damaged to a lesser extent. Wayne Miller brought a new Proctor-Silex toaster to the examination. It wasn't identical but it was very close and revealed the toaster's basic electrical and mechanical design operating principles.

Evidence taken from the loss scene also included the wall receptacle that the toaster was plugged into and a 27-inch (approximate) length of zip cord of unknown origin with its insulation burned off.

EVENT TIME LINE

Jeff's reports provide complete details on the event sequence.

EVIDENCE EXAMINATION AND CAUSE ANALYSIS

Wiring and Receptacle - These were examined for any electrical defects that could have contributed to the loss. No abnormalities or defects were found.

Pop-Tart - The burned Pop-Tart was relatively intact and still in the toaster. There was no evidence that it had interfered with the toaster ejection mechanism. The inside heater element next to the Pop-Tart was coated with a circular shaped residue pattern. This was likely the result of the frosted coating or filling dripping onto the heater element when the toaster was placed on its side during the attempt to extinguish the fire.

Toaster Dial - The dial is set at "6" which is the highest (longest toaster on time) setting.

Line Switch Contacts - The contact operating mechanism was severely burned. The contact operating lever is made of an epoxy-glass material and was burned and delaminated. For this reason, the contacts were in the open condition as it serves to hold them closed. The contact button surfaces were in relatively good condition and didn't show evidence or arcing or burning.

Toast Ejection Mechanism - Under normal conditions the mechanism functions as follows:

- Pushing down the external slide lever stretches a coil spring inside the toaster. This spring stores and provides the energy required to eject the toast.
- A tab engages to hold the mechanism in the down position while the toaster is operating. A solenoid is adjacent to the tab and, when energized at the end of the toast cycle, disengages the tab and releases the spring force to eject the toast.
- The solenoid is energized when a bimetallic mechanism inside the toaster, near one of the heating elements, expands and pushes a rod against a normally open SPST switch in series with the solenoid coil and ac line power. The rod closes the switch thereby providing power to the solenoid. A cam attached to the setting dial knob pretensions the bimetallic mechanism and this controls the toasting time.
- The line switch contacts, providing power to the heater elements, open when the ejection mechanism is at its approximate mid point of travel.

Examination of the toaster revealed the following:

- The ejection mechanism had been released by the solenoid but was in essentially the full down position.
- The first six coils of the ejection spring were damaged severely (stretched and distorted) and this greatly reduced the energy that could be stored in the spring.
- The coils were damaged because the spring was not centered in the hole that allowed it to pass through an opening on a metal portion of the movable ejection mechanism. It was rubbing against the edge of the metal mechanism. The metal edge got caught in between the spring coils when the spring was in the up position. Pushing down on the external slide lever just stretched the first six coils of the spring without stretching any of the remaining spring coils.

The result of the above failure scenario was that the Pop-Tart didn't eject and the toaster heater coils remained on. This allowed the temperature inside the toaster to rise to a level sufficient to ignite the Pop-Tart. The fact that the spring coils caught on the metal edge was due to a manufacturing or design defect in the toaster that allowed the spring to become off center in normal use to the point where it eventually got caught by the metal edge.

COMMENTS

There are no other reports of this same failure mode in the CPSC database for this model toaster. Nevertheless, this toaster had a defect and the defect prevented the toaster from ejecting the Pop-Tart and this caused the Pop-Tart to ignite.

Michael J. Rains, P.E.
Forensic Electrical Engineer
508-997-4900

File Closed

MJR/lpm

Enclosures: 1. Photos (12)
2. Jeff Lowe letter of 7/23/02
3. Examination Protocol

cc: Richard D. Dietzman
Regional Manager

PHOTO DESCRIPTION

1. Original box obtained from tenant

2. Toaster as unpacked from evidence bag

3. Wall receptacle with metal sides removed

4. Length of zip cord conductors with insulation burned off

5. Pop-Tart remnant in toaster "single slice" slot

6. Circular residue pattern on heater element

7. Dial set at position "6"

8. Back view of main switch assembly

9. Ejection mechanism - side view

10. Solenoid - lower right corner

11. Stretched spring - side view showing damage to coils

12. Stretched spring - showing the off-center position and rubbing against metal edge

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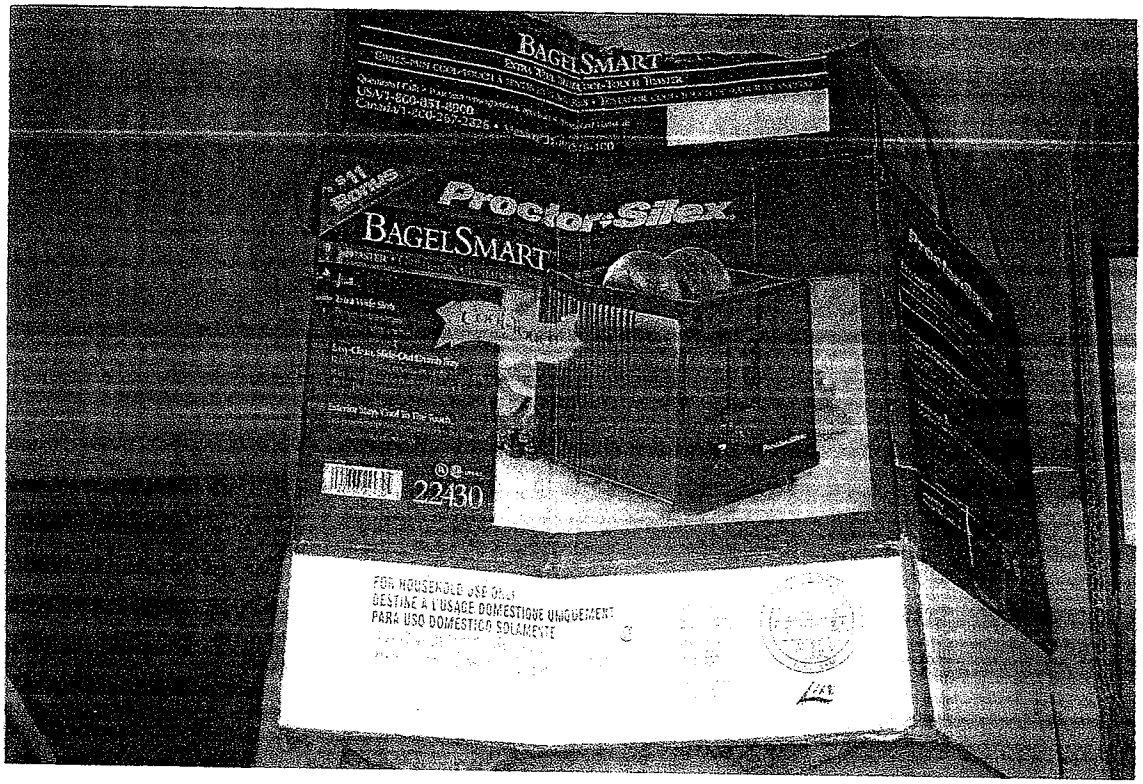
PHOTO SHEET

EFI No: 94507- 17807
Insured: McNeil



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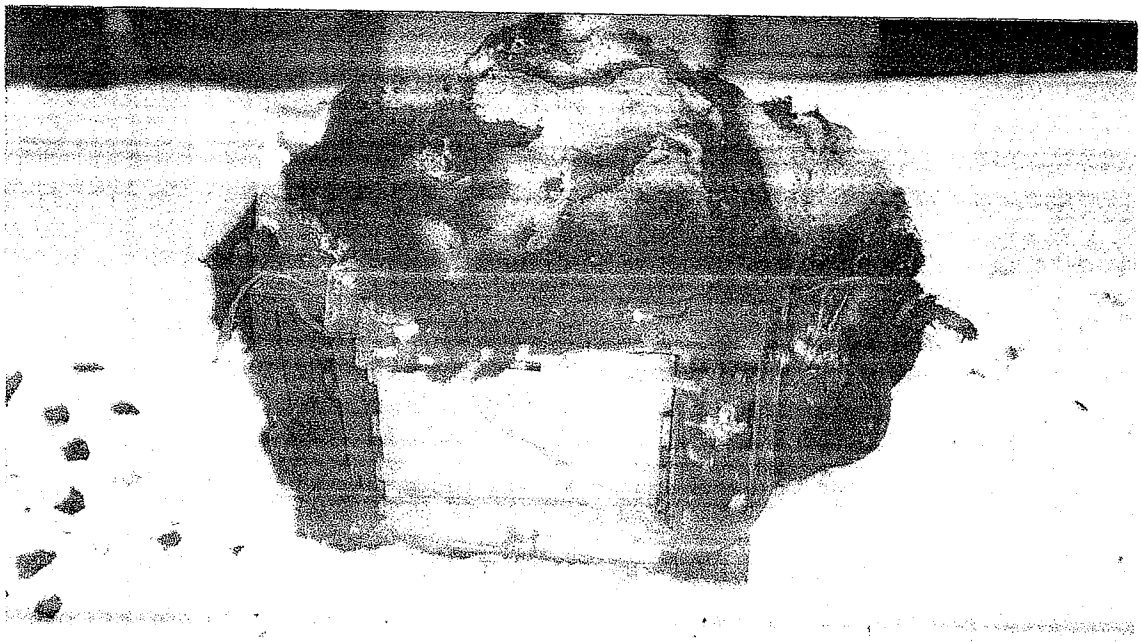

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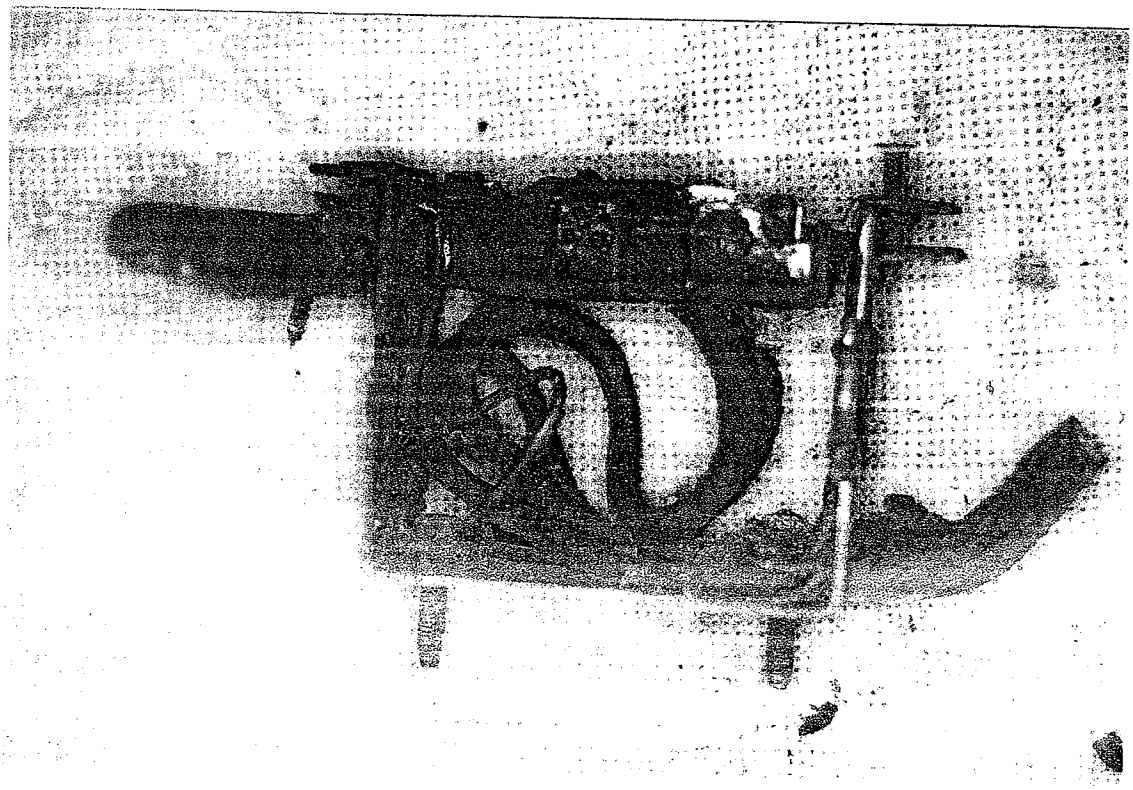

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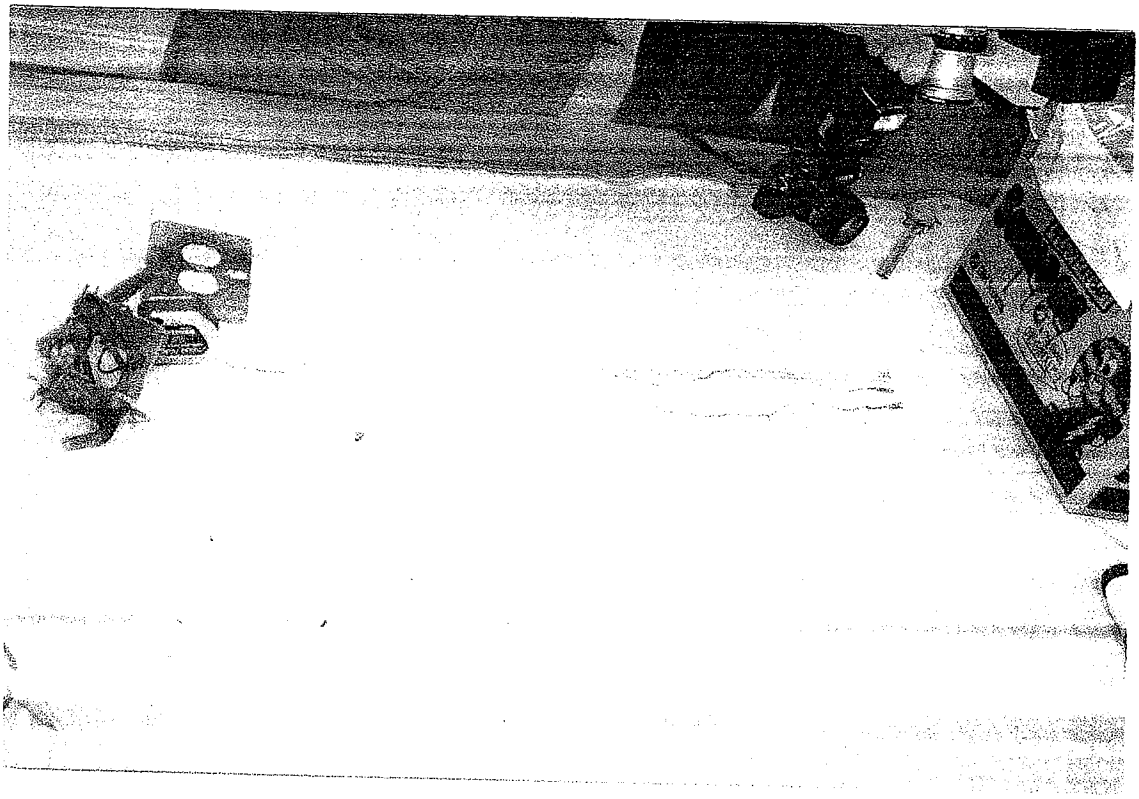

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PHOTO SHEET

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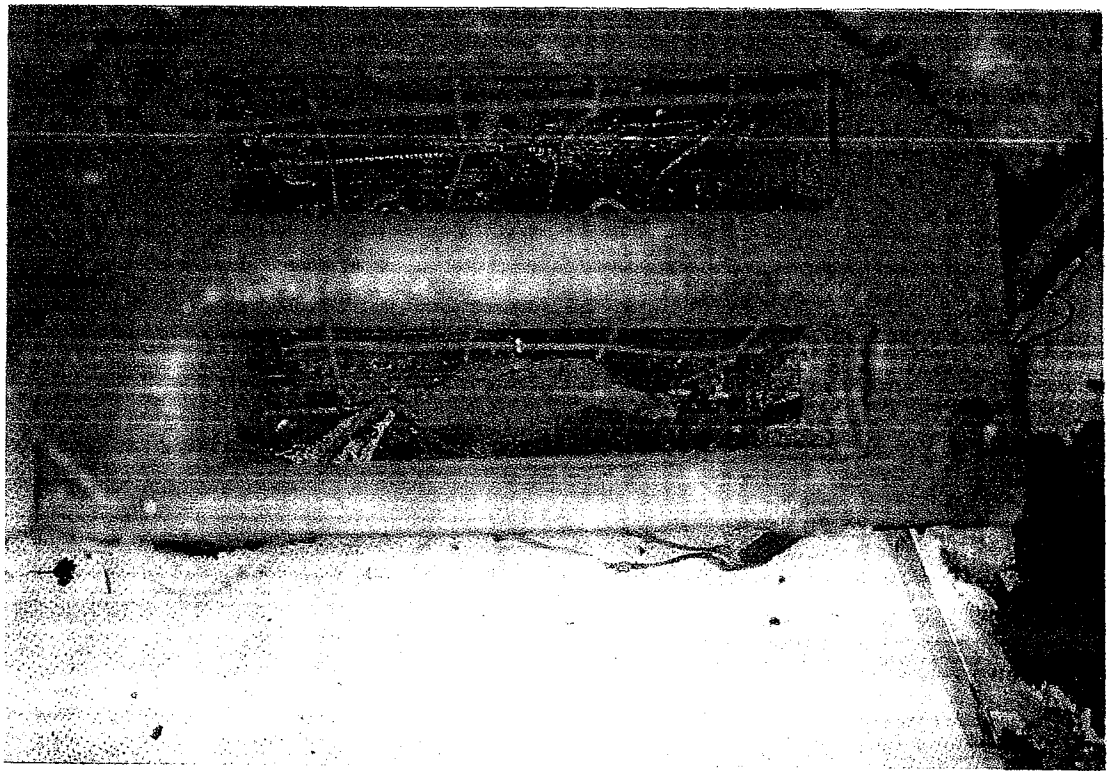

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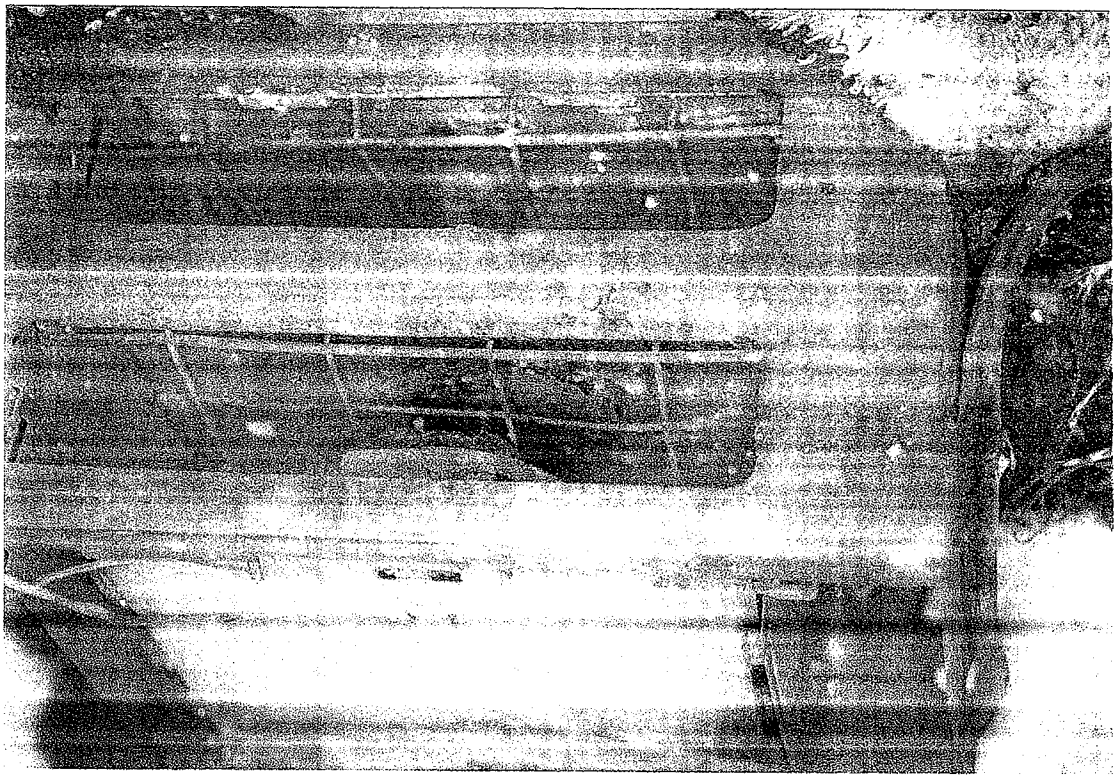

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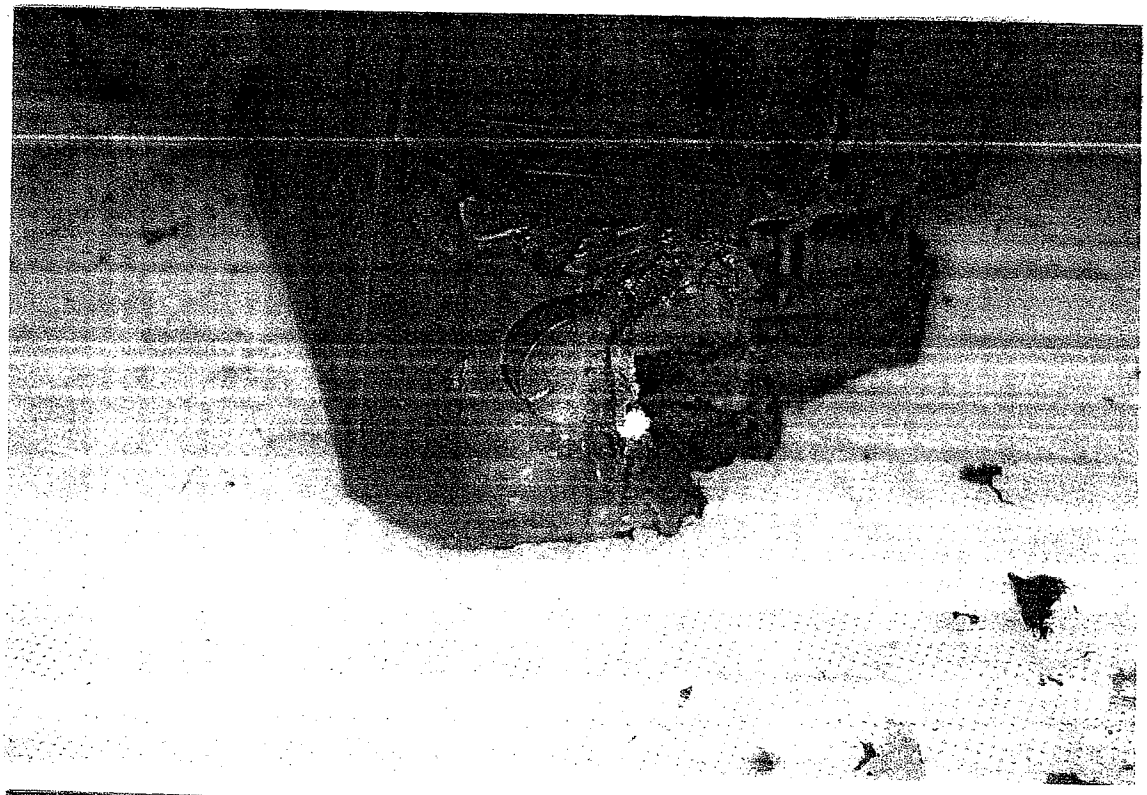

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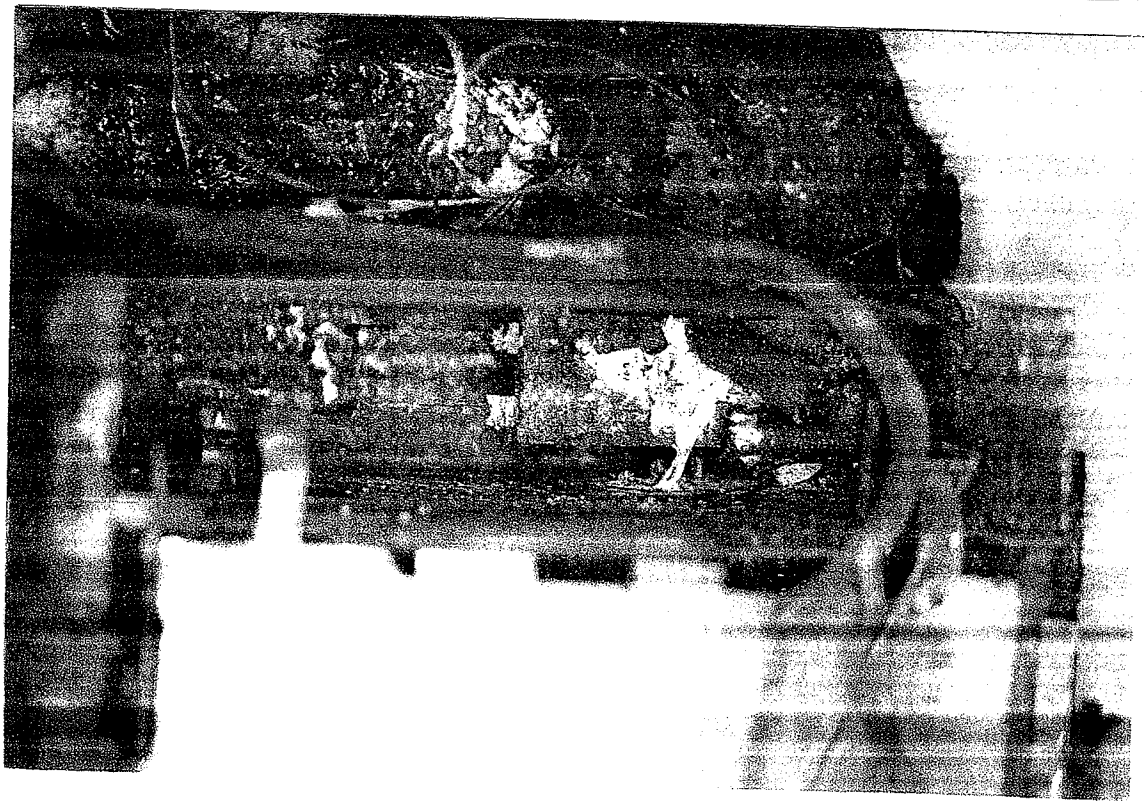

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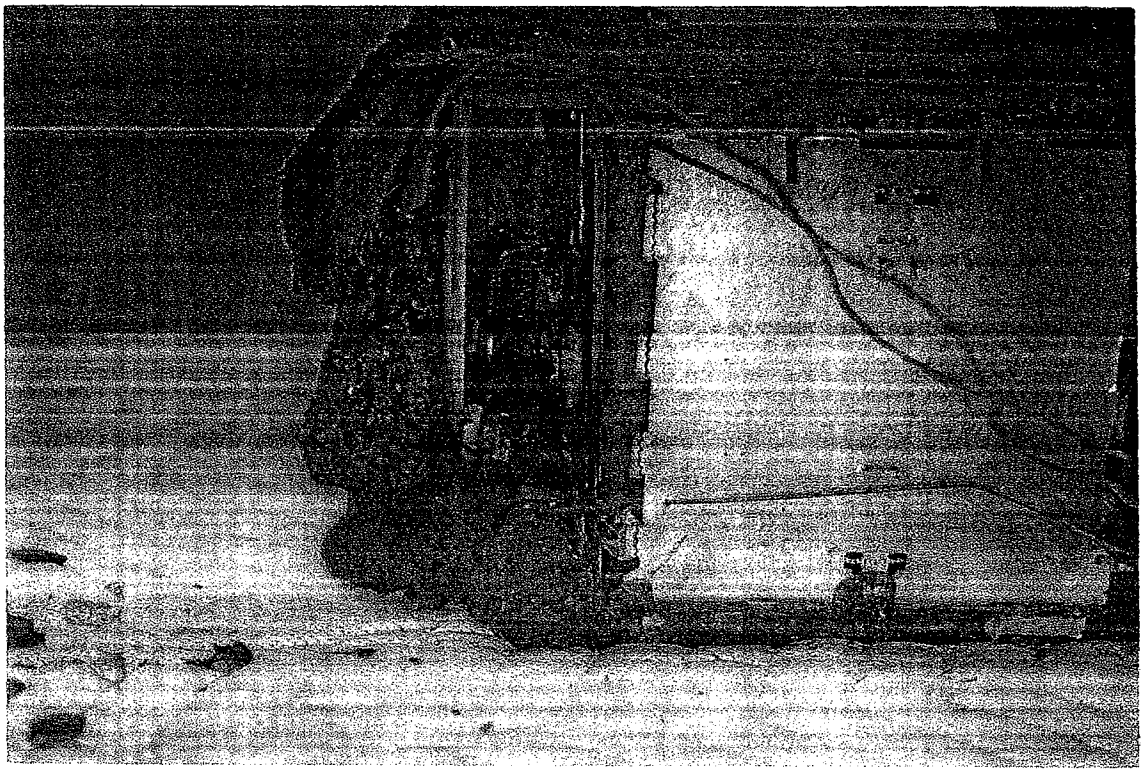

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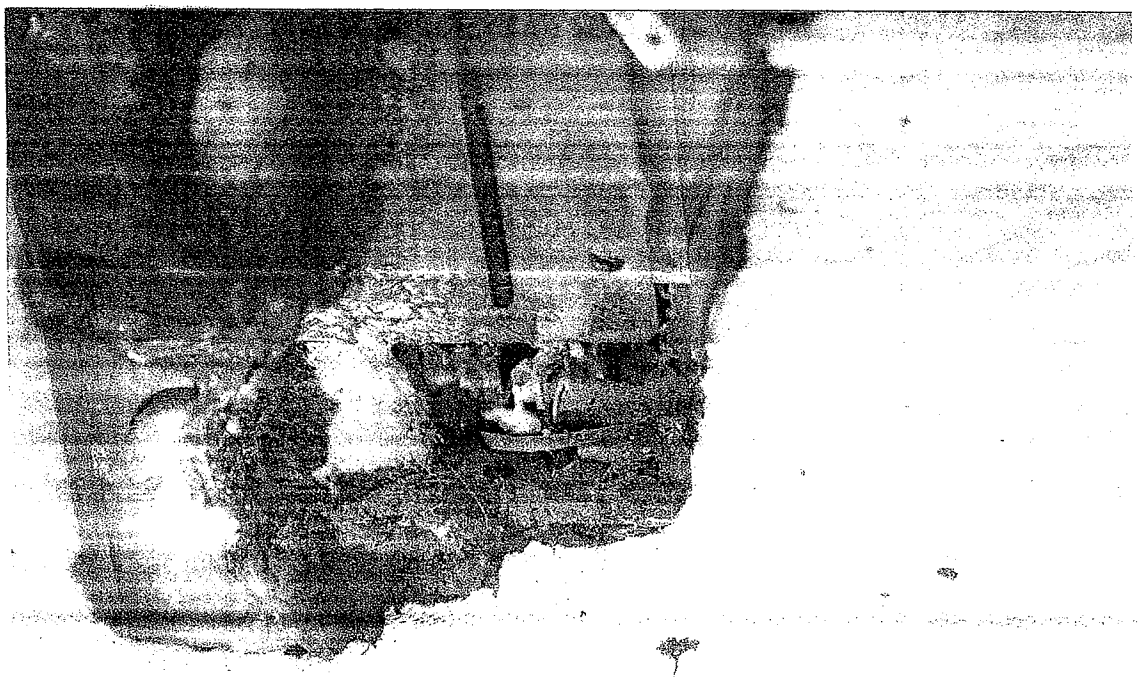

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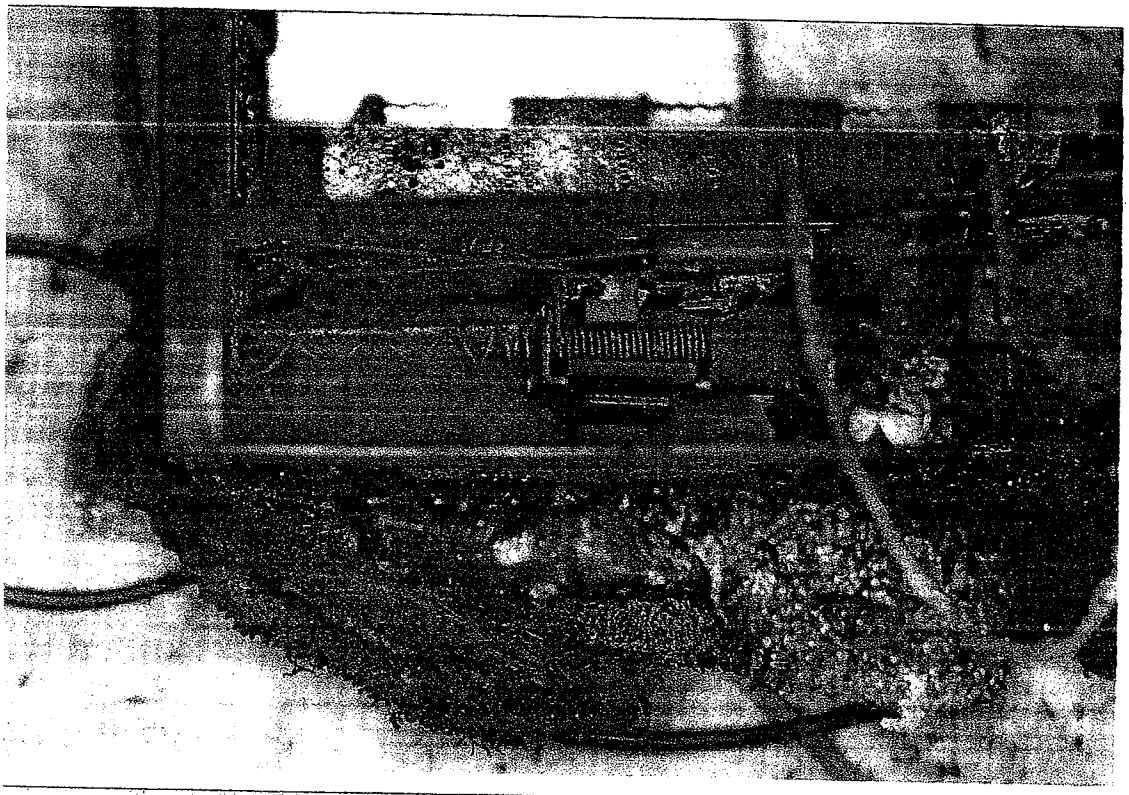

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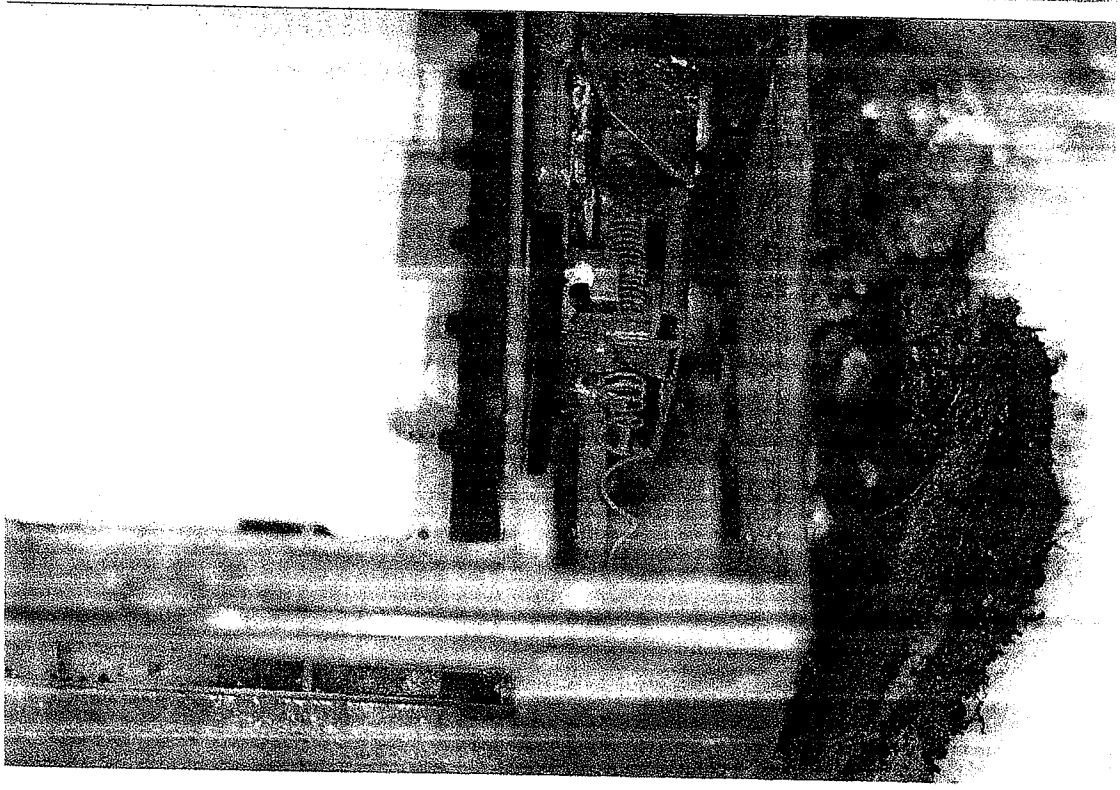

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July 23, 2002

To: Elaine Davis, Hamilton Beach/Proctor-Silex, Fax-804-527-7218
Deborah Blair, NLC Insurance(For tenant), Fax-860-886-8270
Rebecca Emmonds, Constitution State Services(For Kelloggs), Fax-860-277-3664
Jeff Tanski, FTI/SEA(For NLC Insurance), Fax-410-987-1129
Wayne Miller, Wright Group(for Kelloggs), Fax-508-485-3141

RE: The fire at 48-50 Princeton Street
Medford, Massachusetts
Vermont Mutual insured: Nancy McNeil
Vermont Mutual Policy No.: HO12016316
Date of Loss: October, 11, 2001
EFI File No.: 94507-17807

Dear Ladies and Gentlemen:

EFI represents Vermont Mutual Insurance regarding the investigation of the above captioned fire loss. Vermont insures the building owner, Nancy McNeil, who was also the third floor tenant.

The examination of the subject bread toaster and associated wiring will be conducted on Tuesday, August 13, 2002 at 10 A.M. It will be held our New England regional office, 634 State Road(Route 6), North Dartmouth, MA. EFI electrical engineer Mike Rains will be in charge of the inspection.

I thank each of you for your prompt attention to this matter. My direct phone number is 508-886-2043, or by fax at 508-991-8824.

Sincerely,

Jeffrey K. Lowe, CFI, CFEI

cc: Elaine Bedard, Claims Supervisor
Vermont Mutual Insurance

Examination Protocol
for
Proctor-Silex Bagel Smart Toaster and Kellogg Strawberry Pop-Tart

Reference: EFI File No. 94507-17807, loss date 10/11/01, insured: Nancy McNeil, EFI Fire Investigator: Jeff Lowe

Purpose: Examine toaster, its associated wiring and wall receptacle to determine the fire ignition source.

Evidence:

- Qty (1) Proctor-Silex Bagel Smart Extra Wide Slot Cool-Touch Toaster
- Qty (1) Kellogg Strawberry Pop-Tart remnants (in one slot of the toaster)
- Qty (1) toaster power cord and plug blades
- Qty (1) house wall receptacle supplying power to toaster

Method: We will photograph the evidence before we start to document its original condition. We will take additional photographs as the examination proceeds to document the condition of the evidence before and after each step. A scribe will be appointed to document the findings of each step. The sequence will be:

1. Carefully unpack and place all evidence on a table.
2. Determine, if possible, the identity (manufacturer, model and serial number, electrical certifications, etc.) of all electrical items.
3. Document the physical condition of all items.
4. Inspect the remnants of the toaster power cord, looking for signs of arcing between cord conductors.
5. Inspect the power plug blade to wire connections, looking for signs of arcing or local overheating. Measure the resistance of the plug blade to wire connections using an ohmmeter.
6. Inspect the house wall receptacle, looking for signs of arcing inside the receptacle.
7. Inspect the toaster to determine the position of the operating lever (up or down) and the position of the light/dark control dial.
8. Inspect the remnants of the Pop-Tart to determine if they interfered with the toaster mechanical operation.
9. Inspect the toaster timer mechanism to determine if it had signaled for mechanical ejection of the Pop-Tart and electrical shutdown of the toaster.
10. Inspect the toaster main switch contacts for signs of arcing or failure to open.
11. Examine any other aspect of the evidence that appears relevant at any step in the above sequence.